Groundwater arsenic enrichments associated with coal burn remnants along Sutlej River, Punjab, India

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The present research was aimed to examine the groundwater quality with special emphasis on As contamination around Sutlej river, Punjab, India (lat-76°19′00″-76°45′00″ and long-30°44′00″-31°25′00″) based on a preliminary report of up to 390 µg L^{-1} As. The data presented here deals with water and soil geochemistry around a Thermal power plant which is operational at present that yields huge mass of coal ash and its effluent drains to Sutlej river just 1.5 km downstream. Total 5 water and 3 soil samples were included for detailed geochemistry along a traverse of ~5 km across the coal ash piles, while only 2 groundwater samples were included from opposite side of the plant with no such ash dumps for a comparative purpose.

Our first-hand analysis highlights an alarming As enrichment (>1750 µg L^{-1}) from 60-70 m bore well water samples situated within 500 m away from the main ash deposit. In a traverse across a huge ash pile, As concentrations was found to increase towards the ash dumps and it decreased away from it while approaching towards the Sutlej river with ~684 µg L^{-1}. Comparatively, only <500 µg L^{-1} As were measured in two borewells of similar depth on the opposite side. While attempting to understand As relationship with other ions, we observed that SO_4^{2-} has a well correlation with As as like Ca^{2+}, Mg^{2+} and Fe(T).

Based on this initial results we infer that the coal burn ash might be a major input of As to Sutlej river in addition to unknown geogenic origins as evidenced from samples those are not in contact with any ash dumps. The decreasing As content away from the pile suggests likely natural attenuation by aquifer minerals. The ionic correlations, especially Fe(T) and SO_4^{2-}, suggest iron sulphide (e.g., FeS_2) might be an As containing host that liberated As upon its oxidative dissolution releasing both Fe and S although bacterial role yet cannot be overruled. Role of fertilizers on As mobilization seems not to be significant as no correlation could be established between As and PO_4^{3-}/NO_3^-. However, the undergoing mineralogical, soil chemistry and microbial data may bring new insights.